APPLIED ORGANOMETALLIC CHEMISTRY
Appl. Organometal. Chem. **14**, 127–132 (2000)

Book reviews

Copper, Silver, Gold, Zinc, Cadmium, and Mercury
D. K. Breitinger and W. A. Herrmann
Synthetic Methods of Organometallic and Inorganic Chemistry, Volume 5
W. A. Herrmann (ed.)
Georg Thieme Verlag, Stuttgart, 1999
248 pages. DM 124
ISBN 3-13-103061-8

This is part of the Handbook *Synthetic Methods of Organometallic and Inorganic Chemistry* and deals with synthetic methods for copper, silver, gold, zinc, cadmium and mercury compounds. Inorganic and organometallic compounds of these metals find wide applications in organic synthesis, medicine, electrochemistry and materials science.

This book contains the experimental procedures for the preparation of a range of inorganic and organometallic compounds of these metals. Experimental procedures are well covered with important physical properties and spectroscopic data together with a selection of important references. Essential instructions on safety precautions, toxicity and air sensitivity of compounds are covered where required.

The volume is generally well produced and the methods are easy to follow but some of the diagrams could be better. However, the authors have generally succeeded in their aim of covering the experimental procedures for basic and important compounds.

Chapter 3, concerning gold complexes, appears authoritative, but the following chapters (i.e. 4, 5 and 6 for zinc, cadmium and mercury respectively) are far from comprehensive. Some important organometallic and metal–organic complexes of these metals are omitted; perhaps most notably, novel compounds developed for the deposition of chalcogenide-containing materials have been overlooked.

Despite its limitations this is useful book for all those involved in preparative organometallic or inorganic chemistry for the elements concerned.

P. O'BRIEN, M. A. MALIK
Imperial College, London

Chemistry of Advanced Materials: an Overview
L. V. Interrante and M. J. Hampden-Smith (eds)
Wiley, New York, 1998
xii + 580 pages. £70
ISBN 0-471-18590-6

Materials are all around us and within us; without materials the world would be oil drops in an ocean under a clear sky, because materials' is a generic term covering all types of solid. Advanced materials' are those of which research continues to discover new properties, which allow us to classify them. Generally, advanced materials may be important for their strength, durability, light weight, flexibility etc.—the so-called structural materials'; or they may be important for properties such as conductivity, surface area, light emission, magnetism—the functional materials'. This book deals almost exclusively with the functional materials, although the last chapter on Biomaterials' concerns a rather specific type of structural material. This is not to the books detriment, however, as the readership also breaks down into two camps (with interests in the structural and the functional), and with such a vast array of possible materials to cover it is sensible to focus on one area or the other. This book gives an excellent overview of a wide range of functional materials, presenting exciting new advances in the context of the relevant background literature.

It is clearly aimed at chemists who wish to move into the field of materials chemistry and at Ph.D. students starting out in the area, and will be of interest to senior undergraduates or M.Sc. students. As a chemist working very much at the chemicals end of materials chemistry, I found that it gave me the full materials context of our research but it also provided a fascinating insight into areas in which we are not active.

This is a multiauthored text divided into 10 scientific chapters, with a fascinating introduction which places materials research in its historical context, makes the case for closer collaboration between chemists, materials scientists and chemical engineers (I would add physicists and electronic engineers to this list) and justifies further funding for research into this important multi-disciplinary subject. The chapters (Introductory Terms and Concepts; Electron-Transfer Salt-Based Conductors, Superconductors, and Magnets; Advanced Polymeric Materials: Functional Electroactive Polymers; Polymers in Electronics, Chemical Vapor Deposition; Introduction to the Nonlinear Optical Properties of Organic Materials; Nanoparticles and Nanostructural Materials; Nanoporous Materials; Molecular Precursor Routes to Inorganic Solids; Layered Transition Metal Oxides and Chalcogenides; Biomaterials) are all written by well-known experts in the respective fields and all of them include informative (and mostly gentle!) introductions to the area which lead the reader into more detailed discussions of recent advances in the synthesis, properties and applications of the various materials systems.

It is not the intention of the authors to give comprehensive reviews of their areas but rather to give

 CCC 0268–2605/2000/020127–06 $17.50

a flavour of the way things are developing and the reasons why the particular materials systems are important. In this, all are highly successful, although here I must inject a caveat that there appears to have been a long lead-time in producing this book. It appeared in 1998 but although there is a gratifyingly large number of references none is later than 1995 and rather few are past 1990. In some cases this may not materially affect the work, but in rapidly developing fields such as nanoparticles and lithium batteries many new advances have been made that make the book seem a little bit outdated (already!).

Some chapters cover particular materials types, whilst others deal with particular properties or synthetic techniques. This has the potential for overlap between the chapters, but careful editing has removed this pitfall. The one thing that does appear to have suffered is the index, which has some notable omissions—for example, I was unable to find high T_c superconductors' under High T_c, Oxide or Superconductor, although they are covered in the chapter on Layered Transition Metal Oxides and Chalcogenides.

Overall, the coverage is patchy, a major omission being that of liquid crystals, which are hardly mentioned at all. In the chapter on CVD, there is no mention of GaAs, which is now a major player in the solar-cell area, and precious little of III/V materials in general, which have major applications in light-emitting (diode and laser) devices. These semiconductors are probably the largest CVD-produced materials after SnO_2 for glass coatings. Organic/inorganic microporous solids such as MeAlPOs (aluminium methylphosphonates) are missing and there is mention of neither porous silicon nor nano-engineering.

As an overview of the state-of-the-art in advanced materials, this book is a very useful guide and there are one or two stunning points: for example, the graph on p. 58 which shows the uncharacterized $V(TCNE)_x$ to have a magnetic critical temperature some 320 °C above that of any other molecular material and well above room temperature. The list on p. 503 of biomaterials that have recently become unavailable for medical device manufacture as a result of worries about possible law suits, and the costs implied, is as striking as it is depressing since a major crisis in the availability of implants of various kinds will soon be upon us.

Overall, the book is well produced and presented, given its black and white, non-photographic format, but there are some notable proof-reading flaws; for example, in Fig. 8.12 on p. 357, double bonds and five-coordination C atoms are thrown about with gay abandon, and some figures (such as that on p. 58) have poor labelling.

An obvious text for comparison is *Inorganic Materials*, edited by D. W. Bruce and D. O'Hare (Wiley, Chichester, 1992), which, however, concentrates on inorganic functional materials and has a quite different scope. *Chemistry of Advanced Materials* is much broader in scope and the only real overlap is in the biomaterials area (although the new book is much more applications-orientated) and in the chapter on charge-transfer salts. For the chapter on charge-transfer salts, one of the authors is the same in both books, but again the scope of the current text is much broader, perhaps indicating the advances that have been made in the intervening few years.

Overall the book is a good read and well worth having in the library.

D. J. COLE-HAMILTON
University of St Andrews, UK

Transition Metal Sulphides: Chemistry and Catalysis

T. Weber, R. Prins and R. A. van Santen (eds)
Kluwer Academic Publishers, Dordrecht, 1998
364 pages. £99
ISBN 0-7923-5255-6.

The chapters in this book represent contributions based on lectures presented at the NATO Advanced Research Workshop on Challenges for Sulphides in Materials Sciences and Catalysis' held in Bulgaria towards the end of 1997 (even though the book in its best typographical error suggests that the subject is Maternal' Science!). The subject of the workshop was predicated on the rle of transition metal sulphides in the hydrotreatment of crude oil, where molybdenum sulphides combined with either cobalt or nickel supported on γ-alumina form the basis for industrial catalysts.

The 12 chapters cover a large breadth in transition-metal sulphide chemistry and are contributed by internationally respected authors. The general appearance of the book is fine, although poor original artwork from some authors does detract and occasionally borders on the unreadable. The chapters largely break down into three groups covering structure and characterization of solid-state materials, reactivity of soluble metal sulphide systems and catalytic aspects of supported metal sulphides.

Genin and Ibers give a very nice overview of a wide range of solid metal sulphides which sets the scene rather well, and which is complemented by a chapter by Byskov *et al.* on Density Functional Theory (DFT) calculations on sulphur bonding which also argues that the rle of the promoter normally cobalt or nickel in the case of commercial hydrodesulphurization (HDS) catalysts is to create site vacancies. Knowledge of sulphur bonding is of great importance, as related by Hensen, de Beer and van Santen in their chapter on how reactivity depends on the nature of sulphur bonding. Further chapters by Knzinger and by de Jong *et al.* look at the structural characterization of supported and unsupported metal sulphides, while Kogan reports mechanistic studies of C–S bond cleavage reactions and Zdrazil discusses the